

**Before the
Federal Communications Commission
Washington, DC 20554**

In the Matter of)
)
Spectrum Horizons) ET Docket No. 18-21
)
James Edwin Whedbee Petition for Rulemaking) RM-11795
to Allow Unlicensed Operation in the 95-1,000)
GHz Band)

REPLY COMMENTS OF THE mmWAVE COALITION

ON

BOSCH PETITION FOR PARTIAL RECONSIDERATION

The mmWave Coalition (“mmWC” or the “Coalition”)¹ hereby files these Reply Comments opposing the Petition for Partial Reconsideration filed by Robert Bosch LLC (“Bosch”) to the Commission’s *First Report and Order* (“*Order*”) in the above-captioned proceeding. . Specifically, Bosch requests additional authorization of unlicensed operations in the band 123-140 GHz ... using the same technical parameters that apply to the 116-123 GHz band adopted in this proceeding.”² In its petition, Bosch repeatedly uses the phrase “internationally harmonized spectrum” to refer to this spectrum and in justification of its request.

In the recent *Order*, the Commission chose a compromise path of creating 4 new unlicensed bands and creating a novel type of experimental license in the spectrum above 95 GHz that permits use of *any* technology for up to 10 years on *any* frequency in this range, subject to two main conditions: the new “showing” requirement of § 5.702 and the longstanding

¹ The mmWave Coalition is a group of innovative companies united in the objective of removing regulatory barriers to technologies and using frequencies ranging from 95 GHz to 275 GHz. The current members are listed in the Attachment. For more information, please visit <http://mmwavecoalition.org/>.

² Bosch Petition for Partial Reconsideration, Docket 18-21, July 1, 2019

cancellation provisions of § 5.83. mmWC was very pleased with these bold new provisions (although we have some concerns about the details of both § 5.702 and § 5.83, which we discuss below).

Bosch’s use of “internationally harmonized spectrum” is misguided in that it apparently only refers to long standing ITU general allocations for various radio services rather than services rules for more detailed use. As the *NPRM* noted, “in 2014, Japan’s Ministry of Internal Affairs and Communications officially revised its radio regulations to allocate an 18 gigahertz-wide band at 116 GHz to 134 GHz to accommodate such service.”³ In addition, CEPT, the group of communications regulators in the EU and non-EU European area, has adopted unlicensed provisions shown below in Table 1:

	Frequency Band	Power / Magnetic Field	Spectrum access and mitigation requirements	Modulation / maximum occupied bandwidth	In comparable FCC logarithmic units
o1	122-122.25 GHz	10 dBm/250MHz e.i.r.p. -48 dBm/MHz at >30° elevation (note 4)	No requirement	Not specified	10 dBm/250 MHz ...
o2	122.25-123 GHz	100 mW e.i.r.p.	No requirement	Not specified	20 dBm
p	244-246 GHz	100 mW e.i.r.p.	No requirement	Not specified	20 dBm

Table 1: 95+ GHz provisions of CEPT/ERC Recommendation 70-03 Relating to the use of Short Range Devices (SRD)⁴ in Europe with powers also expressed in usual FCC logarithmic units

The *Order’s* unlicensed provisions for maximum transmitter power in the new § 15.258 are significantly higher than the above European provisions, noting that 100 mW e.i.r.p. in the CEPT document is equivalent to 20 dBm in the logarithmic units that the FCC uses. In particular

³ *NPRM* at para.12

⁴ CEPT European Communications Committee, ERC Recommendation 70-03 Relating to the use of Short Range Devices (SRD), Annex I, 7 June 2019 (<https://www.ecodocdb.dk/download/25c41779-cd6e/Rec7003e.pdf>)

the new § 15.258(b) allows 40 dBm average, and 43 dBm peak, power with provisions as high as 82 dBm (average)/85 dBm (peak) for fixed point-to-point use if appropriate narrow beam antennas are used.⁵ The *Order* explains how the unlicensed bands chosen were selected in consideration of Federal Government use of this spectrum.⁶ The Bosch petition asks for the same power levels in an additional 17 GHz of bandwidth without explaining why such high power levels are needed in such a large block of spectrum or addressing how it might impact Federal use of this spectrum.

Technology above 95 GHz is rapidly developing and it is still unclear how various systems will be able to coexist in possibly overlapping bands, including:

- licensed point-to-point systems,
- area licensed mobile systems,
- unlicensed communications systems,
- unlicensed terahertz spectroscopy or nearby sensing systems, and
- satellite based environmental sensing systems.

Due to the nature of propagation at these frequencies and the impact of the small wavelengths above 95 GHz on enabling antenna technologies unfeasible at lower bands the technical options for sharing will be very different than at lower bands.

⁵ We note that the specific wording of § 15.258(b) seems to assume passive antennas such as parabolic dishes or horn antennas for which antenna gain directly relates to beamwidth. It appears to unintentionally disadvantage flat array antennas, *e.g.* MIMO, using multiply elements to achieve high directionality. Such flat antennas can achieve very narrow beams but are limited in maximum gain due to power division losses which are presumably of no regulatory interest. By contrast the parallel provisions of §101.115 allow compliance by way of either a gain measurement or a beamwidth measurement. (Gain measurements are generally less expensive than beamwidth measurements and are thus preferred for dish and horn antenna technologies to show compliance with regulatory goals in beamwidth. §101.115 allows use of the more expensive measurement for multiple element antennas to show they meet the regulatory objective of narrow beamwidth.)

⁶ *ISR&O* at para. 28

While mWCC opposes the Bosch Petition, we agree that the Commission should consider certain modifications to its rules in the future. More bandwidth is needed for terahertz spectroscopy systems which are low-power, short-range systems and are often indoors. The parenthetical remark in the *NPRM* that “the Office of Engineering and Technology currently evaluates applications for devices that use the frequencies above 95 GHz on a case-by-case basis” combined with the lack of *any* findings on terahertz spectroscopy in the *Order* creates uncertainty for this promising new technology. More transparent rules are needed to encourage capital formation for these novel products and investors will likely be unwilling to finance developments where market access is uncertain due to ambiguous regulatory requirements.

Bosch’s need for sensors seems to be limited to 123-140 GHz or perhaps 116-140 GHz when the new unlicensed band authorized in the *Order* is considered. But there is a need for much larger bandwidths in some short range noncommunications applications.⁷ While we do not support the Bosch request for a new unlicensed band, we urge the Commission to create transparent rules for short range large bandwidth unlicensed sensors in spectrum above 95 GHz at much lower powers than the Commission authorized in the initial unlicensed bands. The power limits in these initial unlicensed bands appear to have been selected to permit the possibility of point-to-point communications applications as well as short distance sensing applications. Sensing applications need much lower powers which could be compatible with future service rules for licensed uses if they are carefully chosen.

⁷ An example of these are the devices described by TeraMetrix, a Division of Luna Innovations, Inc., (TeraMetrix) in their comments in this proceeding dated May 2, 2018. TeraMetrix states “that it has been marketing and selling its time domain terahertz instrumentation under the Part 18 rules, which clearly specify operation from 9 KHz to 3THz (47 CFR § 18.107 (a)) for nearly 20 years” and by implication that the “case-by-case review” requirement mentioned in the *NPRM* without any citations does not apply. mmWC does not object to the TeraMetrix’s viewpoint but does feel the present ambiguity on FCC policy and the lack of its codification in normal documentation discourages new entrants in the field.

We note that CTIA's *Opposition*⁸ to the Bosch request reaches the same conclusions we have. Both mmWC and CTIA are concerned that the proposed expansion of unlicensed spectrum above 95 GHz requested by Bosch in its petition will impact the long term availability of new licensed spectrum that both mmWC and CTIA have requested. Bosch fails to mention this impact or explain why their proposed change outweighs the withdrawal of this spectrum back for consideration for licensed use.

We also believe that FCC can dismiss Bosch's petition based on CTIA's finding that the petition is procedurally defective. While the Commission rejected Bosch's initial comments for more unlicensed spectrum, it did create the novel "Spectrum Horizons Experimental Radio Licenses" to address many of these possible uses of unlicensed spectrum without creating long term precedents in this rapidly evolving technical area. Indeed, Bosch's petition does not even mention the new Spectrum Horizons Experimental Radio Licenses and the question of whether or not they are cross elastic with the spectrum uses they advocate.

⁸ CTIA, *Opposition to Petition for Partial Reconsideration*, Docket 18-21, August 15, 2019

We believe that the Spectrum Horizons Experimental Radio Licenses provisions of the *Order* will address most or all of Bosch's immediate concerns as well as the needs of many other developers. The details of the Spectrum Horizons Experimental Radio Licenses have some real issues with the uncertainty they create for developers of new technology. The Coalition plans to work with the Commission and its staff to explain these problems and search for mutually acceptable compromises that maintain the basic structure of the Spectrum Horizons Experimental Radio Licenses in the near term for providing timely access to this spectrum for new technologies while protecting existing federal users in parts of it and keeping future policy options open.

Respectfully submitted,

The mmWAVE COALITION

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cc: Julius Knapp

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ATTACHMENT

mmWave Coalition membership

- American Certification Body, Inc.
- Azbil North America Research and Development, Inc.
- Global Foundries, Inc.
- Keysight Technologies
- National Instruments
- Nokia Corporation
- NSI-MI Technologies
- Nuvotronics, Inc.
- NYU WIRELESS
- Qorvo, Inc.
- RaySecur
- VEGA Americas
- Virginia Diodes, Inc.